PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
101889/KS/JJ		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP 00/ 03756	19/04/2000	30/04/1999
Applicant		
NOKIA NETWORKS OY		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [ ] the text is approved as submitted by the applicant.

   [X] the text has been established by this Authority to read as follows:

   HANDOVER IN A COMMUNICATION SYSTEM

5. With regard to the **abstract,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 3

   [X] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 00/03756

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 725 552 A (TELIA AB) 7 August 1996 (1996-08-07) column 3, line 19 - line 39 column 6, line 43 -column 9, line 1	1,3-6, 8-13
X	US 4 737 978 A (BURKE MICHAEL ET AL) 12 April 1988 (1988-04-12) column 10, line 33 -column 12, line 14	1,3,4,6, 8-13
A	EP 0 883 266 A (TOKYO SHIBAURA ELECTRIC CO) 9 December 1998 (1998-12-09) column 24, line 36 -column 26, line 55	1,7,10
A	WO 98 25431 A (ERICSSON TELEFON AB L M) 11 June 1998 (1998-06-11) page 28, line 10 -page 29, line 24 page 45, line 9 -page 47, line 14	1,10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 August 2000	06/09/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Lõpez-Pérez, M-C

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 00/03756

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0725552 A	07-08-1996	SE 503848 C	16-09-1996
		AU 698681 B	05-11-1998
		AU 4338296 A	15-08-1996
		SE 9500407 A	07-08-1996
		US 5873033 A	16-02-1999
US 4737978 A	12-04-1988	CA 1266884 A	20-03-1990
		US 4775999 A	04-10-1988
EP 0883266 A	09-12-1998	JP 11266278 A	28-09-1999
WO 9825431 A	11-06-1998	US 5920818 A	06-07-1999
		AU 5236398 A	29-06-1998
		BR 9713834 A	29-02-2000
		CN 1245625 A	23-02-2000
		EP 0943219 A	22-09-1999

PATENT COOPERATION TREATY

973

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 28 December 2000 (28.12.00)	
International application No. PCT/EP00/03756	**Applicant's or agent's file reference** 101889/KS/JJ
International filing date (day/month/year) 19 April 2000 (19.04.00)	**Priority date** (day/month/year) 30 April 1999 (30.04.99)
Applicant HONKALA, Hannu et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

28 November 2000 (28.11.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Juan Cruz
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Copy for the Elected Office (EO/US)

PCT/EP00/03756

973

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

STYLE, Kelda, Camilla, Karen
Page White & Farrer
54 Doughty Street
London WC1N 2LS
ROYAUME-UNI

Date of mailing (day/month/year)
20 February 2001 (20.02.01)

Applicant's or agent's file reference
101889/KS/JJ

IMPORTANT NOTIFICATION

International application No.
PCT/EP00/03756

International filing date (day/month/year)
19 April 2000 (19.04.00)

1. The following indications appeared on record concerning:

[X] the applicant [X] the inventor [ ] the agent [ ] the common representative

Name and Address
SIIK, Tapio
Pohjalantie 12
FIN-37500 Lempaala
Finland

State of Nationality: FI
State of Residence: FI
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [ ] the name [X] the address [ ] the nationality [X] the residence

Name and Address
SIIK, Tapio
79 Buchman Drive
Lexington, MA 02421
Finland

State of Nationality: FI
State of Residence: US
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[X] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
R. Raissi

Telephone No.: (41-22) 338.83.38

003849677

Form PCT/IB/306 (March 1994)

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

STYLE, Kelda, Camilla, Karen
Page White & Farrer
54 Doughty Street
London WC1N 2LS
ROYAUME-UNI

RECEIVED
17 MAY 2001

Date of mailing (day/month/year) 08 May 2001 (08.05.01)	
Applicant's or agent's file reference 101889/KS/JJ	**IMPORTANT NOTIFICATION**
International application No. PCT/EP00/03756	**International filing date** (day/month/year) 19 April 2000 (19.04.00)

1. The following indications appeared on record concerning:

[X] the applicant [X] the inventor [ ] the agent [ ] the common representative

Name and Address	State of Nationality	State of Residence
SIIK, Tapio Pohjalantie 12 FIN-37500 Lempaala Finland	FI	FI
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [ ] the name [X] the address [ ] the nationality [X] the residence

Name and Address	State of Nationality	State of Residence
SIIK, Tapio 79 Buchman Drive Lexington, MA 02421 United States of America	FI	US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

CORRECTED VERSION

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[X] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Dominique DELMAS
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/306 (March 1994)

004011185

WO 00/67514
PCT/EP00/03756

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:
STYLE, Kelda, Camilla, Karen
Page White & Farrer
54 Doughty Street
London WC1N 2LS
ROYAUME-UNI

Date of mailing (day/month/year) 09 November 2000 (09.11.00)	
Applicant's or agent's file reference 101889/KS/JJ	**IMPORTANT NOTICE**

International application No.	**International filing date** (day/month/year)	**Priority date** (day/month/year)
PCT/EP00/03756	19 April 2000 (19.04.00)	30 April 1999 (30.04.99)

Applicant
NOKIA NETWORKS OY et al

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
   AG,AU,DZ,KP,KR,US

   In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
   AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,
   GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,
   NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW
   The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
   09 November 2000 (09.11.00) under No. WO 00/67514

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, **a demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer
J. Zahra

Telephone No. (41-22) 338.83.38

KCS

P.B.5818 - Patentlaan 2
2280 HV Rijswijk (ZH)
☎ (070) 3 40 20 40
TX 31651 epo nl
FAX (070) 3 40 30 16

Europäisches Patentamt	Eur[illegible]n Patent Office	Office européen des brevets
Zweigstelle in Den Haag	Branch at The Hague	Département à La Haye

PAGE WHITE & FARRER
Attn. Ms. Kelda Style
54 Doughty Street
LONDON WC1N 2LS
UNITED KINGDOM

RECEIVED
7 - OCT 1999

Aktenzeichen/File No./No. du Dossier	RS 103181 GB
Datum/Date	06. 10. 99

Das Europäische Patentamt übermittelt hiermit den Standardrecherchenbericht zu dem unten bezeichneten Antrag; Kopien der im Recherchenbericht angeführten Schriften werden in der Anlage beigefügt.

The European Patent Office herewith transmits the Standard Search Report relating to the request indicated below; copies of the documents cited in the search report are enclosed.

L'Office Européen des Brevets à l'honneur de vous transmettre ci-joint le Rapport de Recherche concernant la demande désignée ci-dessous; des copies des documents cités sont jointes.

Zeichen und Datum des Antrages Applicant's reference and date Références et date de la demande	87677/KCS/DG
Dokument, Gegenstand der Recherche Document subject of the search Objet de la recherche	GBA 9910115
Einreichungstag Filing date Date de dépôt	30/04/1999
Beanspruchte Priorität Priority claimed Priorité revendiquée	

OFFICE EUROPÉEN DES BREVETS
Pour le Vice-Président,

[illegible]

European Patent Office

STANDARD SEARCH REPORT

File RS 103181

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	EP 0 725 552 A (TELIA AB) 7 August 1996 (1996-08-07) * column 3, line 19 - line 39 * * column 6, line 43 - column 9, line 1 *	1-5,7,8
X	US 4 737 978 A (BURKE MICHAEL ET AL) 12 April 1988 (1988-04-12) * column 10, line 33 - column 12, line 14 *	1-3,5,7, 8
A	EP 0 883 266 A (TOKYO SHIBAURA ELECTRIC CO) 9 December 1998 (1998-12-09) * column 24, line 36 - column 26, line 55 *	1,6,7
A	WO 98 25431 A (ERICSSON TELEFON AB L M) 11 June 1998 (1998-06-11) * page 28, line 10 - page 29, line 24 * * page 45, line 9 - page 47, line 14 *	1,7

TECHNICAL FIELDS SEARCHED (Int.CL.6)

H04Q

The present search report has been drawn up for all claims

Date of completion of the search	Examiner
1 October 1999	Lopez-Pérez, M-C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C17)

ANNEX TO THE STANDARD SEARCH REPORT NO.

RS 103181

This annex lists the patent family members relating to the patent documents cited in the above-mentioned search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

01-10-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0725552 A	07-08-1996	SE 503848 C	16-09-1996
		AU 698681 B	05-11-1998
		AU 4338296 A	15-08-1996
		SE 9500407 A	07-08-1996
		US 5873033 A	16-02-1999
US 4737978 A	12-04-1988	CA 1266884 A	20-03-1990
		US 4775999 A	04-10-1988
EP 0883266 A	09-12-1998	NONE	
WO 9825431 A	11-06-1998	US 5920818 A	06-07-1999
		AU 5236398 A	29-06-1998
		EP 0943219 A	22-09-1999

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ EPO

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA	Date of receipt of DEMAND

Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference: 101889/KCS/CW/SJW
International application No.: PCT/EP00/03756	International filing date *(day/month/year)*: 19th April 2000	(Earliest) Priority date *(day/month/year)*: 30th April 1999

Title of invention: HANDOVER IN A COMMUNICATION SYSTEM

Box No. II APPLICANT(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

Nokia Networks Oy
Keilalahdentie 4
FIN-02150 ESPOO
Finland

Telephone No.:

Facsimile No.:

Teleprinter No.:

State *(that is, country)* of nationality: FINLAND

State *(that is, country)* of residence: FINLAND

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

HONKALA, Hannu
Villilänkatu 6 D 18
FIN-33300 Tampere

State *(that is, country)* of nationality: FINLAND

State *(that is, country)* of residence: FINLAND

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

HÄNNINEN, Timo
Aitoniitynkatu 38
FIN-33580
Tampere

State *(that is, country)* of nationality: FINLAND

State *(that is, country)* of residence: FINLAND

[x] Further applicants are indicated on a continuation sheet.

Sheet No. 2

International application No.
PCT/EP00/03756

Continuation of Box No. II APPLICANT(S)

If none of the following sub-boxes is used, this sheet should not be included in the demand.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

MICKOS, Roy
Pajakatu 9 A 11
FIN-33100 Tampere

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
FINLAND	FINLAND

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

NÄRVÄNEN, Kai
Mesimarjakuja 4
FIN-33960 Pirkkala

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
FINLAND	FINLAND

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

RAUTIOLA, Markku
Kaonpäänkatu 47
FIN-33820 Tampere

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
FINLAND	FINLAND

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

RISSANEN, Pekka
Yrttikatu 8 A 3
FIN-33710 Tampere

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
FINLAND	FINLAND

☒ Further applicants are indicated on another continuation sheet.

Sheet No. 3.

International application No.

Continuation of Box No. II APPLICANT(S)

If none of the following sub-boxes is used, this sheet should not be included in the demand.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

SIIK, Tapio
79 Buckman Drive
Lexington
MA 02421
USA

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
FINLAND	USA

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

UOSUKAINEN, Petri
Pomeranssinkuja 7
FIN-33710 Tampere

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
FINLAND	FINLAND

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

☐ Further applicants are indicated on another continuation sheet.

International application No.
PCT/EP00/03756

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is [x] agent [ ] common representative

and [x] has been appointed earlier and represents the applicant(s) also for international preliminary examination.

[ ] is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

[ ] is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

Kelda Camilla Karen Style
Page White & Farrer
54 Doughty Street
London WC1N 2LS
United Kingdom

Telephone No.: 020 7831 7929

Facsimile No.: 020 7831 8040

Teleprinter No.: 8955681

[ ] **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special addr ess to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments:*

1. The applicant wishes the international preliminary examination **to start on the basis of:**

[x] the international application as originally filed

the description [x] as originally filed
[ ] as amended under Article 34

the claims [ ] as originally filed
[x] as amended under Article 19 (together with any accompanying statement)
[ ] as amended under Article 34

the drawings [x] as originally filed
[ ] as amended under Article 34

2. [ ] The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. [ ] The applicant wishes the start of the international preliminary examination **to be postponed** until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: EN

[x] which is the language in which the international application was filed.
[ ] which is the language of a translation furnished for the purposes of international search.
[ ] which is the language of publication of the international application.
[ ] which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby **elects all eligible States** *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes **not to elect:**

Sheet No. 5

International application No. PCT/EP00/03756

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:			For International Preliminary Examining Authority use only: received	not received
1. translation of international application	:	0 sheets	☐	☐
2. amendments under Article 34	:	0 sheets	☐	☐
3. copy (or, where required, translation) of amendments under Article 19	:	3 sheets	☐	☐
4. copy (or, where required, translation) of statement under Article 19	:	0 sheets	☐	☐
5. letter	:	1 sheets	☐	☐
6. other *(specify)*	:	0 sheets	☐	☐

The demand is also accompanied by the item(s) marked below:

1. [x] fee calculation sheet
2. [ ] separate signed power of attorney
3. [ ] copy of general power of attorney; reference number, if any:
4. [ ] statement explaining lack of signature
5. [ ] nucleotide and or amino acid sequence listing in computer readable form
6. [ ] other *(specify)*:

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

VIRGINIA ROZANNE DRIVER (Authorised Representative)

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3. [ ] The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. [ ] The applicant has been informed accordingly.
4. [ ] The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5. [ ] Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/EP 00 / 03756

International Application No.

19 APR 2000 (19.04.2000)

International Filing Date

EUROPEAN PATENT OFFICE
PCT INTERNATIONAL APPLICATION

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* 101889/KS/JJ

Box No. I TITLE OF INVENTION

HANDOVER IN A COMMUNICATION SYSTEM

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

Nokia Networks Oy
Keilalahdentie 4
FIN-02150 ESPOO
Finland

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

HONKALA, Hannu
Villilänkatu 6 D 18
FIN-33300 Tampere
FI

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

STYLE, Kelda Camilla Karen
Page White & Farrer
54 Doughty Street
London WC1N 2LS
United Kingdom

Telephone No. 0171 831-7929

Facsimile No. 0171 831-8040

Teleprinter No. 8955681

☐ **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

HÄNNINEN, Timo
Aitoniitynkatu 38
FIN-33580 Tampere
FI

This person is:
- [ ] applicant only
- [X] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [X] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

MICKOS, Roy
Pajakatu 9 A 11
FIN-33100 Tampere
FI

This person is:
- [ ] applicant only
- [X] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [X] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

NÄRVÄNEN, Kai
Mesimarjakuja 4
FIN-33960 Pirkkala
FI

This person is:
- [ ] applicant only
- [X] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [X] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

RAUTIOLA, Markku
Kaonpäänkatu 47
FIN-33820 Tampere
FI

This person is:
- [ ] applicant only
- [X] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [X] the United States of America only
- [ ] the States indicated in the Supplemental Box

- [ ] Further applicants and/or (further) inventors are indicated on another continuation sheet.

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

RISSANEN, Pekka
Yrttikatu 8 A 3
FIN-33710 Tampere
FI

This person is:
- [ ] applicant only
- [X] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [X] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

SIIK, Tapio
Pohjalantie 12
FIN-37500 Lempaala
FI

This person is:
- [ ] applicant only
- [X] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [X] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

UOSUKAINEN, Petri
Pomeranssinkuja 7
FIN-33710 Tampere
FI

This person is:
- [ ] applicant only
- [X] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [X] the United States of America only
- [ ] the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:
- [ ] applicant only
- [ ] applicant and inventor
- [ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of:
- [ ] all designated States
- [ ] all designated States except the United States of America
- [ ] the United States of America only
- [ ] the States indicated in the Supplemental Box

- [ ] Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

☒ AP **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT

☒ EA **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT

☒ EP **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT

☒ OA **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* .....

National Patent *(if other kind of protection or treatment desired, specify on dotted line)*:

☒ AE United Arab Emirates
☒ AL Albania
☒ AM Armenia
☒ AT Austria
☒ AU Australia
☒ AZ Azerbaijan
☒ BA Bosnia and Herzegovina
☒ BB Barbados
☒ BG Bulgaria
☒ BR Brazil
☒ BY Belarus
☒ CA Canada
☒ CH and LI Switzerland and Liechtenstein
☒ CN China
☒ CR Costa Rica
☒ CU Cuba
☒ CZ Czech Republic
☒ DE Germany
☒ DK Denmark
☒ DM Dominica
☒ EE Estonia
☒ ES Spain
☒ FI Finland
☒ GB United Kingdom
☒ GD Grenada
☒ GE Georgia
☒ GH Ghana
☒ GM Gambia
☒ HR Croatia
☒ HU Hungary
☒ ID Indonesia
☒ IL Israel
☒ IN India
☒ IS Iceland
☒ JP Japan
☒ KE Kenya
☒ KG Kyrgyzstan
☒ KP Democratic People's Republic of Korea
☒ KR Republic of Korea
☒ KZ Kazakhstan
☒ LC Saint Lucia
☒ LK Sri Lanka
☒ LR Liberia
☒ LS Lesotho
☒ LT Lithuania
☒ LU Luxembourg
☒ LV Latvia
☒ MA Morocco
☒ MD Republic of Moldova
☒ MG Madagascar
☒ MK The former Yugoslav Republic of Macedonia
☒ MN Mongolia
☒ MW Malawi
☒ MX Mexico
☒ NO Norway
☒ NZ New Zealand
☒ PL Poland
☒ PT Portugal
☒ RO Romania
☒ RU Russian Federation
☒ SD Sudan
☒ SE Sweden
☒ SG Singapore
☒ SI Slovenia
☒ SK Slovakia
☒ SL Sierra Leone
☒ TJ Tajikistan
☒ TM Turkmenistan
☒ TR Turkey
☒ TT Trinidad and Tobago
☒ TZ United Republic of Tanzania
☒ UA Ukraine
☒ UG Uganda
☒ US United States of America
☒ UZ Uzbekistan
☒ VN Viet Nam
☒ YU Yugoslavia
☒ ZA South Africa
☒ ZW Zimbabwe

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

~~☒ Republic of Seychelles~~ RO/E1
☒ Antigua & Barbuda AG
~~☒ People's Democratic Republic of~~ ☒ Algeria DZ

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)*

Supplemental Box *If the Supplemental Box is not used, this sheet should not be included in the request.*

*1. If, in any of the Boxes, **the space is insufficient** to furnish all the information: in such case, write "Continuation of Box No. ..." [indicate the number of the Box] and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:*

*(i) **if more than two persons are involved as applicants and/or inventors** and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;*

*(ii) if, in Box No. II or in any of the sub-boxes of Box No. III, the indication **"the States indicated in the Supplemental Box"** is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;*

*(iii) if, in Box No. II or in any of the sub-boxes of Box No. III, **the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America**: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;*

*(iv) if, in addition to the agent(s) indicated in Box No. IV, there are **further agents**: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;*

*(v) if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "**patent of addition**," or "**certificate of addition**," or if, in Box No. V, the name of the United States of America is accompanied by an indication "**continuation**" or "**continuation-in-part**": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;*

*(vi) if, in Box No. VI, there are **more than three earlier applications whose priority is claimed**: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI;*

*(vii) if, in Box No. VI, **the earlier application is an ARIPO application**: in such case, write "Continuation of Box No. VI", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed.*

*2. If, with regard to the **precautionary designation statement** contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.*

*3. If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning **non-prejudicial disclosures or exceptions to lack of novelty**: in such case, write "Statement concerning non-prejudicial disclosures or exceptions to lack of novelty" and furnish that statement below.*

Continuation of Box IV

Agents continues

PALMER, ROGER (GB)
RICHARDS, DAVID JOHN (GB)
PENDLEBURY, ANTHONY (GB)
JENKINS, PETER DAVID (GB)
DRIVER, VIRGINIA ROZANNE (GB)
DANIELS, JEFFERY NICHOLAS (GB)
NEOBARD, WILLIAM JOHN (GB)
SHACKLETON, NICOLA (GB)
SLINGSBY, PHILIP ROY (GB)
HILL, CHRISTOPHER MICHAEL (GB)
RUUSKANEN, JUHA-PEKKA (FIN)

ALL OF: PAGE WHITE & FARRER
54 Doughty Street
London WC1N 2LS
United Kingdom

PCT/EP 00/03756

Box No. VI PRIORITY CLAIM ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) 30 April 1999	GB 9910115.6	GB		
item (2) (30-04-1999)				
item (3)				

☐ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s): _____

** Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used)* : ISA / EP

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority):*

Date (day/month/year)	Number	Country (or regional Office)
1 October 1999	RS 103181	EP

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following **number of sheets**:

request	: 6
description (excluding sequence listing part)	: 21
claims	: 4
abstract	: 1
drawings	: 8
sequence listing part of description	:
Total number of sheets	: ~~36~~ 40

RO / EP

This international application is **accompanied by** the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☒ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other *(specify)*:

Figure of the drawings which should accompany the abstract: 3

Language of filing of the international application: English

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

STYLE, Kelda Camilla Karen Kelda Style .....(Agent)

For receiving Office use only

1. Date of actual receipt of the purported international application: (19.04.2000) 19 APR 2000
2. Drawings: ☒ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA /
6. ☐ Transmittal of search copy delayed until search fee is paid.

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
101889/KCS/CW/SJW		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP00/03756	19/04/2000	30/04/1999
International Patent Classification (IPC) or national classification and IPC H04Q7/38		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
28/11/2000	07.08.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Schweitzer, J-C Telephone No. +49 89 2399 8963

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/03756

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-21 as originally filed

Claims, No.:

1-9 with telefax of 23/07/2001

Drawings, sheets:

1/8-8/8 as originally filed

2. With regard to the **language,** all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1 - 9
	No:	Claims
Inventive step (IS)	Yes:	Claims 1 - 9
	No:	Claims
Industrial applicability (IA)	Yes:	Claims 1 - 9
	No:	Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

Concerning section V.2 (reasoned statement under Article 35(2) PCT)

Present claim 1 relates to a method for handing-off a mobile station from an internal cellular communications network to an external cellular communications network, wherein any handover between internal and external networks is prepared in advance. More specifically, in the claimed method at least one cell of the internal cellular network is allocated as a border cell and the movement of the mobile station into said border cell is monitored in order to predict an external handover. When such a handover is likely to be required, an advance hand-off request is generated in the internal system and sent to the external system, so as to establish a waiting connection, which will be used when the actual handover request is made.

Such a handover method is known from the cited prior art document **EP-A-0 725 552 (Telia)**, hereinafter referred to as document **D1,** which is concerned with handovers between a DECT-type network and a GSM-type network having thus different communications standards.

The claimed method differs therefrom in that both the internal and the external cellular networks use the same communications standards for radio frequency communications and in that the internal network is a packet switched network, e.g. the WIO (Wireless Intranet Office) system.

Claim 1 is therefore novel and considered to involve the required inventive step, Articles 33(2) and (3) PCT, since it is considered that the teaching of **D1** relating to "non-compatible" DECT/GSM systems do not give any incentive for the skilled person to arrive at the present invention. The subject-matter of claim 1 is also industrially applicable.

The same applies to independent claim 7 defining a network controller, which is drafted in structural terms and corresponds essentially to method claim 1.
Claim 7, therefore, equally meets all the requirements of Article 33 PCT.

Dependent claims 2 to 6, 8 and 9 relate to further implementing details of the method and network controller defined by the independent claims to which they refer and are thus equally novel, inventive and industrially applicable.

Concerning section VII (form and contents).

The independent claims are not drafted in the proper two-part "characterised" form recommended by Rule 6.3.(b),(i),(ii) PCT, having a preamble that correctly reflects the nearest prior art, presumably that represented by the above noted **D1**.

The opening part of the description including the summary of the invention (on pages 8 and 9) should have been brought into agreement with the wording of the amended independent.

In order to meet the requirements of Rule 5.1.(a),(ii) PCT, the relevant prior art document D1 noted above should have been acknowledged by reference and briefly discussed in the introductory part of the description.

The claims do not include reference signs in parentheses where features shown in the drawings are referred to, Rule 6.2.(b) PCT.

CLAIMS:

1. A method of handing off a mobile station from an internal cellular communications network to an external cellular communications network having a network controller, the method comprising:

allocating at least one cell of the internal cellular network as a border cell;

detecting the movement of said mobile station into said border cell;

generating an advance hand-off request in accordance with a prediction algorithm which uses a set of predetermined parameters associates with said mobile station and determines when a hand-off is likely to be required; and

response to said advance hand-off request setting up a communications channel in the external cellular communications network for use by said mobile station when an actual hand-off request is made,

wherein said external network is a mobile communications network and said internal network is a packet switched network and said internal cellular network transmits and receives a plurality of signals using the same communication standard for radio frequency communication as said external cellular network.

2. A method according to claim 1, wherein said network controller implements hand-off to said communication response to an actual hand-off request.

3. A method according to any preceding claims, wherein said mobile station is in communication with a base transceiver station in the internal cellular communications network prior to hand-off.

4. A method according to claim 3, wherein said predetermined parameters for use by said prediction algorithm includes timing

advance information reported from the base station to the mobile station.

5. A method according to any preceding claim, wherein the internal cellular communications network comprises an internal network controller which carries out the prediction and issues said hand-off advance request.

6. A method according to claim 5, wherein said hand-off advance request is issued in packet format via a packet communication path from the internal network controller to said network controller of said external network.

7. A network controller for use in an internal cellular communications network, said internal network is a packet switched network and comprises a plurality of cells and including at least one border cell, said at least one border cell being adjacent cells of an external mobile cellular communications network having an external network controller, the internal network controller comprising:

means for detecting the movement of said mobile station into said border cell;

means for selectively issuing a hand-off advance request advising said network controller of said external network that a hand-off is likely to be required in accordance with a predetermined algorithm which uses a set of predetermined parameters associated with said mobile station; and

means for setting up a communication channel in the external communications network for use by said mobile station when an actual hand-off request is made,

said internal cellular network transmits and receives a plurality of signals using the same communication standard for radio frequency communication as said external cellular network.

8. An internal cellular network controller according to claim 7, comprising a base transceiver station operable to set up an RF communication channel with said mobile station.

9. A network controller according to claim 7 or 8, wherein said external network controller is in communication with said internal network controller by a packet communication path for transmission of said hand-off advance request.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
101889/KCS/CW/SJW		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP00/03756	19/04/2000	30/04/1999
International Patent Classification (IPC) or national classification and IPC H04Q7/38		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
28/11/2000	07.08.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Schweitzer, J-C Telephone No. +49 89 2399 8963

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/03756

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-21 as originally filed

Claims, No.:

1-9 with telefax of 23/07/2001

Drawings, sheets:

1/8-8/8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1 - 9
	No:	Claims
Inventive step (IS)	Yes:	Claims 1 - 9
	No:	Claims
Industrial applicability (IA)	Yes:	Claims 1 - 9
	No:	Claims

2. Citations and explanations
   see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

Concerning section V.2 (reasoned statement under Article 35(2) PCT)

Present claim 1 relates to a method for handing-off a mobile station from an internal cellular communications network to an external cellular communications network, wherein any handover between internal and external networks is prepared in advance. More specifically, in the claimed method at least one cell of the internal cellular network is allocated as a border cell and the movement of the mobile station into said border cell is monitored in order to predict an external handover. When such a handover is likely to be required, an advance hand-off request is generated in the internal system and sent to the external system, so as to establish a waiting connection, which will be used when the actual handover request is made.

Such a handover method is known from the cited prior art document **EP-A-0 725 552 (Telia)**, hereinafter referred to as document **D1,** which is concerned with handovers between a DECT-type network and a GSM-type network having thus different communications standards.

The claimed method differs therefrom in that both the internal and the external cellular networks use the same communications standards for radio frequency communications and in that the internal network is a packet switched network, e.g. the WIO (Wireless Intranet Office) system.

Claim 1 is therefore novel and considered to involve the required inventive step, Articles 33(2) and (3) PCT, since it is considered that the teaching of **D1** relating to "non-compatible" DECT/GSM systems do not give any incentive for the skilled person to arrive at the present invention. The subject-matter of claim 1 is also industrially applicable.

The same applies to independent claim 7 defining a network controller, which is drafted in structural terms and corresponds essentially to method claim 1.
Claim 7, therefore, equally meets all the requirements of Article 33 PCT.

Dependent claims 2 to 6, 8 and 9 relate to further implementing details of the method and network controller defined by the independent claims to which they refer and are thus equally novel, inventive and industrially applicable.

Concerning section VII (form and contents).

The independent claims are not drafted in the proper two-part "characterised" form recommended by Rule 6.3.(b),(i),(ii) PCT, having a preamble that correctly reflects the nearest prior art, presumably that represented by the above noted **D1**.

The opening part of the description including the summary of the invention (on pages 8 and 9) should have been brought into agreement with the wording of the amended independent.

In order to meet the requirements of Rule 5.1.(a),(ii) PCT, the relevant prior art document D1 noted above should have been acknowledged by reference and briefly discussed in the introductory part of the description.

The claims do not include reference signs in parentheses where features shown in the drawings are referred to, Rule 6.2.(b) PCT.

CLAIMS:

1. A method of handing off a mobile station from an internal cellular communications network to an external cellular communications network having a network controller, the method comprising:

allocating at least one cell of the internal cellular network as a border cell;

detecting the movement of said mobile station into said border cell;

generating an advance hand-off request in accordance with a prediction algorithm which uses a set of predetermined parameters associated with said mobile station and determines when a hand-off is likely to be required; and

responsive to said advance hand-off request setting up a communication channel in the external cellular communications network for use by said mobile station when an actual hand-off request is made,

wherein said external network is a mobile communications network and said internal network is a packet switched network.

2. A method according to claim 1, wherein said internal cellular network transmits and receives a plurality of signals using the same communication standard as said external cellular network.

3. A method according to claim 1 or 2, wherein said network controller implements hand-off to said communication responsive to an actual hand-off request.

4. A method according to any preceding claim, wherein said mobile station is in communication with a base transceiver station in the internal cellular communications network prior to hand-off.

5. A method according to claim 4, wherein said predetermined parameters for use by said prediction algorithm includes timing advance information reported from the base station to the mobile station.

6. A method according to any preceding claim, wherein the internal cellular communications network comprises an internal network controller which carries out the prediction and issues said hand-off advance request.

7. A method according to claim 6, wherein said hand-off advance request is issued in packet format via a packet communication path from the internal network controller to said network controller of said external network.

8. A method of handing off a mobile station from an internal cellular communications network to an external cellular communications network having a network controller, the method comprising:

allocating at least one cell of the internal cellular network as a border cell;

detecting the movement of said mobile station into said border cell;

generating an advance hand-off request in accordance with a prediction algorithm which uses a set of predetermined parameters associated with said mobile station and determines when a hand-off is likely to be required; and

responsive to said advance hand-off request setting up a communication channel in the external cellular communications network for use by said mobile station when an actual hand-off request is made,

wherein said hand-off advance request is issued in packet format via a packet communication path from the internal network to said network controller of said external network.

9. A method according to claim 8, wherein said internal cellular telecommunications network comprises an internal network controller which carries out the prediction and issues said hand-off advance request.

10. A network controller for use in an internal cellular communications network, said internal network is a packet switched network and comprises a plurality of cells and including at least one border cell, said at least one border cell being adjacent cells of an external mobile cellular communications network having an external network controller, the internal network controller comprising:

means for detecting the movement of said mobile station into said border cell;

means for selectively issuing a hand-off advance request advising said network controller of said external network that a hand-off is likely to be required in accordance with a predetermined algorithm which uses a set of predetermined parameters associated with said mobile station; and

means for setting up a communication channel in the external communications network for use by said mobile station when an actual hand-off request is made.

11. An internal cellular network controller according to claim 10, comprising a base transceiver station operable to set up an RF communication channel with said mobile station.

12. A network controller according to claim 10 or 11, wherein said external network controller is in communication with said internal network controller by a packet communication path for transmission of said hand-off advance request.

13. A network controller for use in an internal cellular communications network which comprises a plurality of cells and including at least one border cell, said at least one border cell

being adjacent cells of an external cellular communications network having an external network controller, the internal network controller comprising:

means for detecting the movement of said mobile station into said border cell;

means for selectively issuing a hand-off advance request advising said network controller of said external network that a hand-off is likely to be required in accordance with a predetermined algorithm which uses a set of predetermined parameters associated with said mobile station; and

means for setting up a communication channel in the external communications network for use by said mobile station when an actual hand-off request is made,

wherein said external network controller is in communication with said internal network controller by a packet communication path for transmission of said hand-off advance request.

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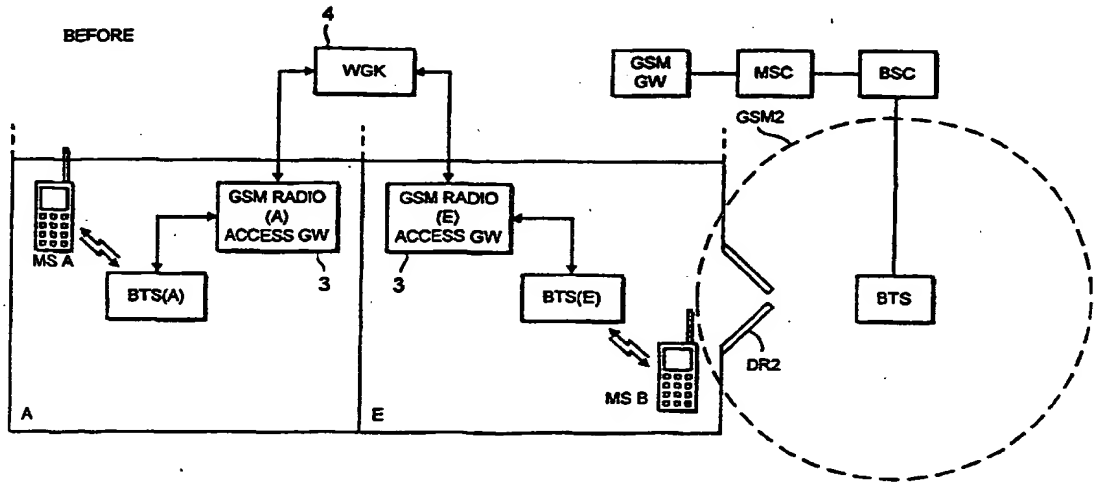

(57) Abstract

A method of handing off a mobile station (MS B) from an internal cellular communications network to an external cellular communications network having a network controller, the method comprising: allocating at least one cell of the internal cellular network as a border cell (E); detecting the movement of said mobile station (MS B) into said border cell (E); generating an advance hand–off request in accordance with a prediction algorithm which uses a set of predetermined parameters associated with said mobile station (MS B) and determines when a hand–off is likely to be required; and responsive to said advance hand–off request setting up a communication channel in the external cellular communications network for use by said mobile station (MS B) when an actual hand–off request is made, wherein said external network and said internal network is a packet switched network.

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HANDOVER IN A COMMUNICATION SYSTEM

FIELD OF INVENTION

The present invention is related to handovers in a communication system and particularly, but not exclusively, to mobile telephone station handovers in an IP-based telecommunications network.

BACKGROUND TO INVENTION

Prior art office-based communications systems usually operate conventional fixed-line telephone units linked via an internal switchboard or PBX (private branch exchange.) Such fixed-line systems are able to provide relatively high voice quality. However, user mobility is severely impaired.

The advent of digital mobile technologies such as GSM, however, means that mobile systems can now provide equivalent, if not higher, voice quality than fixed-line systems. Mobile systems also allow greater freedom of movement for the user within the office than do fixed-line systems.

WIO (Wireless Intranet Office) is a proprietary communications system developed by the applicants which introduces the concept of utilising mobile telephone units, such as conventional GSM mobile stations, in an office environment. The system makes use of a known concept called Internet Telephony or Voice-over-IP.

Voice-over-IP is a technology which allows sound, data and video information to be transmitted over existing IP-based Local or Wide Area Networks or the Internet. The technology thus provides for convergence and integration of three different media types over the same network.

Prior to the advent of Voice-over-IP, offices often operated three separate networks for the transmission of these media types. As indicated above, fixed-line telephone systems coupled to an in-house PBX provided for voice communication, an office-based LAN or Intranet (i.e a packet-switched internal network), comprising computer terminals linked via network cards and under the control of a server station, provided for the transmission of "conventional" computer data and video cameras linked to monitors via fixed line or remote transmission link provided for video communication.

Voice-over-IP effectively combines these three media types such that they can be transmitted simultaneously on the same packet-switched network or IP-router throughout the office environment and beyond the confines of the office.

In order to provide for such media convergence, Voice-over-IP often uses a specific ITU (International Telecommunication Union) standard protocol to control the media flow over the Intranet. One common standard protocol used in Voice-over-IP systems, and the one used in the WIO system, is termed H.323.

H.323 is an ITU standard for multimedia communications (voice, video and data) and allows multimedia streaming over conventional packet-switched networks. The protocol provides for call control, multimedia management and bandwidth management for both point-to-point (2 end-users) and multipoint (3 or more end-users) conferences. H.323 also supports standard video and audio codecs (compression/decompression methods such as MPEG) and supports data sharing via the T.120 standard.

Furthermore, H.323 is network, platform and application independent allowing any H.323 compliant terminal to operate in conjunction with any other terminal.

The H.323 standard defines the use of three further command and control protocols:

a) H.245 for call control;

b) Q.931 based protocol for call signalling; and

c) The RAS (Registrations, Admissions and Status) signalling function.

The H.245 control protocol is responsible for control messages governing the operation of the H.323 terminal including capability exchanges, commands and indications. Q.931 is used to set up a connection between two terminals. RAS governs registration, admission and bandwidth functions between endpoints and gatekeepers (defined later).

For a H.323 based communication system, the standard defines four major components:

1. Terminal

2. Gateway

3. Gatekeeper

4. Multipoint Control Unit (MCU)

Terminals are the user end-points on the network, e.g a telephone or fax unit or a computer terminal. All H.323 compliant terminals must support voice communications, but video and data support is optional.

Gateways connect H.323 networks to other networks or protocols. For an entirely internal communications network, i.e. with no

external call facility, gateways are not required.

Gatekeepers are the control centre of the Voice-over-IP network. It is under the control of a gatekeeper that most transactions (communication between two terminals) are established. Primary functions of the gatekeeper are address translation, bandwidth management and call control to limit the number of simultaneous H.323 connections and the total bandwidth used by those connections. An H.323 "zone" is defined as the collection of all terminals, gateways and multipoint-control units (MCU - defined below) which are managed by a single gatekeeper.
Multipoint Control Units (MCU) support communications between three or more terminals. The MCU comprises a multipoint controller (MC) which performs H.245 negotiations between all terminals to determine common audio and video processing capabilities, and a multipoint processor (MP) which routes audio, video and data streams between terminals.

The conventional Voice-over-IP system described herein above normally utilise standard fixed-line telephone systems which are subject to the disadvantages outlined above, namely the lack of mobility and the lack of user commands.

The WIO concept takes Voice-over-IP further in that it provides for the use of conventional mobile telephone units, such as GSM mobile stations, within the Voice-over-IP system. To provide for such mobile communications within an intra-office communication network, WIO combines known Voice-over-IP, as described above, with conventional GSM-based mobile systems.

Thus, intra-office calls are routed through the office intranet and extra-office calls are routed conventionally through the GSM network. Such a system provides most or all of the features supported by the mobile station and the network such as telephone directories, short messaging, multiparty services, data calls,

call barring, call forwarding etc. WIO, therefore, provides for integrated voice, video and data communications by interfacing an H.323-based voice-over-IP network with a GSM mobile network.

The WIO system is a cellular network, similar to the conventional GSM network and is divided into H.323 Zones as described above. One H.323 Zone may comprise a number of (GSM) radio cells. Two or more H.323 zones may be contained within an administrative domain. The allocation of H.323 zones to an administrative domain is an issue primarily concerning billing and is therefore not relevant to this invention.

Given the cellular nature of the WIO system, a major issue to be solved is that of handovers. As a mobile station moves from one cell to another it reports its location to a base station or equivalent controller. When it moves from one zone to another, a handover is required of the call to another controller. A similar consideration applies to mobile stations in the conventional GSM network.

In such conventional GSM systems, the need for a handover of a mobile station to a different cell of the network is normally determined by a number of parameters but predominantly including the mobile station measuring the strength of signals transmitted from several base transceiver stations.

During the time that it is in a particular cell, the mobile station continuously receives signals from several base transceiver stations in adjacent cells and compares the signal strength of the signals received from each of these stations. If the level of a signal transmitted by a base transceiver station, located in a different cell from that of the mobile, reaches a certain threshold level T1 in relation to that of the base transceiver station located in the mobile station's current cell, the WIO network may determine that a handover to that cell is

required and will issue a handover request to the network controller (mobile services switching centre).

In a similar manner, a mobile station operating in the WIO system is able to compare the signal strengths of the signals received by several base stations, in different cells, in the network.

However, added complexities arise for handovers in the WIO system since a mobile unit operating therein must not only be able to move between cells within the WIO system, but also between zones and even between the WIO system itself and an external GSM network.

It can be seen, therefore, that there are several different types of handovers which may need to be executed in the normal operation of a WIO system. These types of handovers are:

a) The handover of a mobile from one WIO cell to another.

b) The handover of a mobile from one WIO zone to another.

c) The handover of a mobile from a cell within the WIO system to a cell within an external GSM system.

d) The handover from a cell within an external GSM system to a cell within the WIO system.

A particular problem to be solved when implementing a WIO system is that outlined in item c) above; that is, to provide for handover of a mobile station from the WIO system to an external network such as GSM, particularly in situations where the initial call was a WIO internal call (i.e. the call was set up in the WIO system itself).

As will be described later, in such a situation, the initial call

set up is made entirely within the WIO system by the system components. No information regarding the call or the mobile stations involved in the call is transmitted outside of the WIO system.

It is apparent, therefore, that any external network, for example a GSM network, and in particular the main network controller within that network such as the Mobile Switching Centre (MSC), are entirely unaware of the existence of the call. No information regarding the identity of the calling mobile stations, the call channels or the location of the calling mobile stations is received by the main network controller.

As a consequence, therefore, if one of the calling mobile stations moves out of a cell of the WIO system and into a cell of an external network, the main network controller of the external network will be unable to perform a handover until such time as it has established all of the information required to perform the handover, such as those listed above. The establishing of this information takes a relatively long time during which the mobile station and the terminal with which it is in communication are continuously transmitting and receiving data packets. If the time to execute the handover is too long, data packets will be lost and voice communication will be significantly impaired.

In order to reduce the time needed to execute a handover of a mobile station to an external network and thus to prevent such unwanted impairment of the call, a method is needed to provide for early notification of an impending handover to the external main network controller such that the main network controller is able to commence set up of the call handover in advance of the handover request actually being made.

SUMMARY OF INVENTION

According to one aspect of the present invention there is provided a method of handing off a mobile station from an internal cellular communications network to an external cellular communications network having a network controller, the method comprising: allocating at least one cell of the internal cellular network as a border cell; detecting the movement of said mobile station into said border cell; generating an advance hand-off request in accordance with a prediction algorithm which uses a set of predetermined parameters associated with said mobile station and determines when a hand-off is likely to be required; and responsive to said advance hand-off request setting up a communication channel in the external cellular communications network for use by said mobile station when an actual hand-off request is made, wherein said external network is a mobile communications network and said internal network is a packet switched network.

According to a further aspect of the present invention there is provided a method of handing off a mobile station from an internal cellular communications network to an external cellular communications network having a network controller, the method comprising: allocating at least one cell of the internal cellular network as a border cell; detecting the movement of said mobile station into said border cell; generating an advance hand-off request in accordance with a prediction algorithm which uses a set of predetermined parameters associated with said mobile station and determines when a hand-off is likely to be required; and responsive to said advance hand-off request setting up a communication channel in the external cellular communications network for use by said mobile station when an actual hand-off request is made, wherein said hand-off advance request is issued in packet format via a packet communication path from the

internal network to said network controller of said external network.

According to a further aspect of the present invention there is provided a network controller for use in an internal cellular communications network said internal network is a packet switched network and comprises a plurality of cells and including at least one border cell adjacent cells of an external mobile cellular communications network having an external network controller, the internal network controller comprising: means for detecting the movement of said mobile station into said border cell; means for selectively issuing a hand-off advance request advising said network controller of said external network that a hand-off is likely to be required in accordance with a predetermined algorithm which uses a set of predetermined parameters associated with said mobile station; and means for setting up a communication channel in the external communications network for use by said mobile station when an actual hand-off request is made.

According to a further aspect of the present invention there is provided a network controller for use in an internal cellular communications network said internal network is a packet switched network and comprises, a plurality of cells and including at least one border cell, said at least one border cell being adjacent cells of an external mobile cellular communications network having an external network controller, the internal network controller comprising: means for detecting the movement of said mobile station into said border cell; means for selectively issuing a hand-off advance request advising said network controller of said external network that a hand-off is likely to be required in accordance with a predetermined algorithm which uses a set of predetermined parameters associated with said mobile station; and means for setting up a communication channel in the external communications network for

use by said mobile station when an actual hand-off request is made.

In particular, where the internal cellular communications network comprises a base transceiver station in RF communication with said mobile station, up-link and/or down-link timing advance information may be used to estimate the movement of said mobile station to assist in predicting when to issue a hand-off advance request.

When a hand-off request is issued by said mobile station, hand-off may be implemented in accordance with a communication channel which has been set up by the network controller of said external network responsive to the hand-off advance request.

Thus, call set up to the surrounding system may be begun some time before the actual demand for handover.

Thus, according to the embodiment of the invention described herein, when a local telephone call is going on between two subscribers in a WIO location area, it is possible for subscribers to make a handover to a surrounding public GSM network. A call set-up is done some time before the actual demand for the handover. A special prediction for the demand is calculated in the local WIO system and handover preparation is started early enough for the MSC of the GSM network to make required arrangements for the handover. In the WIO system, some cells are defined as border area cells. A prediction algorithm is used to calculate a demand for handover to the surrounding network. In addition to normal handover parameters like up-link and down-link information, timing advance can be used to estimate a subscriber movement and the need for this kind of handover.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, and to show how the same may be carried into effect, the present invention will now be described in more detail with reference to the accompanying drawings in which:

Figure 1a is a block diagram showing some of the components used in the implementation of a WIO system;

Figure 1b is a block diagram illustrating the communication pathways used during a call between an internal mobile station and an external mobile station;

Figure 1c is a block diagram illustrating the communication pathways used during a call between two internal mobile stations operating under the same gatekeeper;

Figure 1d is a block diagram illustrating the communication pathways used during a call between two internal mobile stations operating under different gatekeepers;

Figure 2 shows the cellular nature of the WIO system;

Figure 3 is a block diagram illustrating the communication pathways between components of the WIO system and the GSM network before the mobile;

Figure 4 is a block diagram illustrating the communication pathways between components of the WIO system and the GSM network during the mobile handover; and

Figure 5 is a block diagram illustrating the communication pathways between components of the WIO system and the GSM network after the mobile handover.

BRIEF DESCRIPTION OF EMBODIMENTS OF THE PRESENT INVENTION

A WIO system can be provided in an office and operator environment based on an IP (Internal Protocol) based LAN (Local Area Networks) 10 which are operable to carry packet form data.

One or more mobile stations (MS) 1 communicate, i.e. transmit signals to and/or receive signals from, a base transceiver station (BTS) 2. The base transceiver station 2 used in the WIO system is similar to base transceiver stations used in conventional GSM mobile communications systems in that it is connected to, and operates in conjunction with, a controller. In a conventional GSM system ,the controller is termed a base station controller (BSC); in WIO, however, the controller is represented by an GSM Radio Access Gateway 3, the function of which will be described later.

The base transceiver station 2 therefore receives signals transmitted by the mobile unit 1 and forwards them to the GSM Radio Access Gateway 3. The GSM Radio Access Gateway 3 is also connected to the IP-based LAN 10.

A WIO Gatekeeper (WGK) 4 is connected to the IP-based LAN 10.

WIO allows for the use of mobile telephone in the office environment to make both intra- and extra-office calls. The functions of each of the components of Figure 1 will now be described in more detail.

The GSM Radio Access Gateway 3 performs similar functions to that of a base station controller in a conventional GSM network such as the management of radio resources and channel configuration and the handling of the Base transceiver station configuration. However, the GSM Radio Access Gateway 3 also provides conversion from GSM voice data to packet-based data suitable for transmitting on the packet-based LAN.

The WIO Gatekeeper 4 is the main controller of the WIO system. It is responsible for all of the functions which the H.323 protocol defines to its gatekeeper, including call management and call signalling. The WIO Gatekeeper is able to manage the main

different call types such as voice, data, facsimile and conference calls which can be established between a mobile station, a computer terminal and a normal telephone in any combination.

An GSM gateway 8 handles the communication between the WIO environment and the GSM network. It is connected to the Mobile Switching Centre (MSC) of the GSM network. From the MSC viewpoint, the WIO appears to be a conventional base station controller.

The telephone calls managed by the WIO system can be divided into internal calls and external calls. Internal calls are those calls where both parties to the call are located within the WIO system, and external calls involve any telecommunication terminal which is not located within the WIO system.

The functions of the WIO system components described above will now be described, with reference to Figure 1b, in the context of a telephone call from a mobile station located within the WIO system (mobile A) to a mobile station located in an external network such as a GSM network (mobile B)

The mobile station A transmits a radio frequency (RF) transmission signal TX, on a predetermined RF communication channel, to the base transceiver station 2 in a format conventional to GSM communications systems such as a time-slot format. The communication channel on which the mobile station A transmits the RF transmission signal TX is determined in a manner conventional to GSM communication systems.

The base transceiver station 2 receives the RF transmission signal, down-converts it and then forwards it to the GSM Radio Access Gateway 3. In this respect, the base transceiver station 2 and the GSM Radio Access Gateway 3 operate in a manner similar to a base transceiver station and a base station controller

respectively in a conventional GSM network.

The GSM Radio Access Gateway 3 receives the down-converted transmission signal from the base transceiver station 2 and converts it from the conventional GSM time-slot format, to a packet-based format which allows it to be transmitted along the LAN or IP based network. This is referred to herein as the PAYLOAD. Also, the GSM Radio Access Gateway 3 composes a control signal CTRL which includes signalling information, for example, identification of the destination mobile unit, the IP address corresponding to that mobile unit and/or identification of the source mobile unit.

The control signal CTRL is then routed, in packet format, via the LAN or IP based network, to the Gatekeeper 4 which based on the information contained in the control signal CTRL, determines whether the mobile station B is located within the WIO system or external to the WIO system. If the mobile station B lies outside the WIO system, e.g. a conventional GSM mobile unit operating in the GSM network, the Gatekeeper 4 routes the CTRL signal to the GSM gateway 8 via LAN 10 and the corresponding PAYLOAD information is transmitted in packet format via the LAN 10 between the GSM gateway 8 and GSM Radio Access Gateway 3. The GSM gateway 8 converts the packet-based PAYLOAD to circuit-switched time slot information for the mobile services switching centre MSC. The MSC then handles the PAYLOAD and the CTRL information in a manner to a conventional GSM network.

Calls which are completely internal to the WIO system are handled slightly differently, as shown in Figure 1c. The RF transmission signal TX, in timeslot format, transmitted by the mobile A is again sent to the BTS 2 which performs down conversion of the signal. The down-converted signal is forwarded to the GSM Radio Access Gateway 3 which performs format conversion to generate a PAYLOAD packet and a control packet CTRL. From the GSM Radio

Access Gateway 3, the control signal CTRL is sent to the Gatekeeper 4 which determines if the mobile station B is within the WIO system and, if so, in which H.323 Zone it is located.

If the mobile station B is operating in the same H.323 Zone as the mobile station A, i.e. under the same Gatekeeper, the Gatekeeper 4 will receive a paging response signal from the destination GSM Radio Access Gateway, i.e. the GSM Radio Access Gateway under which the mobile station B is operating via the LAN 10, and then routes the payload along the LAN 10 to that destination GSM Radio Access Gateway 3.

The destination GSM Radio Access Gateway 3 converts the payload signal into a timeslot format. It is then sent, via its base transceiver station which performs up-conversion to RF, to the mobile station B.

If the mobile station is in a different H.323 zone to the mobile station A, the gatekeeper 4 routes the payload signal to the destination gatekeeper 4 via the LAN 10. The destination gatekeeper 4 is the one under which the second mobile station B is operating. This scenario is shown in Figure 1d. The destination gatekeeper 4 will also send a paging message to each GSM radio access gateway 3 under its control. If it receives an acknowledgement from one of the GSM radio access interfaces, it routes the payload signal from the source GSM radio access gateway 3 to the destination GSM radio access gateway via the LAN 10 and out to the mobile station B, via the base station as described in relation to Figure 1c.

Figure 2 is a diagram showing the cellular nature of the WIO system.

Reference numeral 100 represents the office environment denoted by the same numeral in Figure 1 and the perimeter of the box 100

may be considered to represent the wall of the office in which the WIO system is implemented.

Within the office, the WIO system provides a cellular communications network, similar to that of a conventional mobile network such as GSM. Within the office 100, therefore, there are a number of cells (A...H). In Figure 2, there are 8 cells configured as squares. The number and shape of the cells implemented in the WIO system is not restricted to these characteristics, however. They are depicted in Figure 2 in this manner for ease of representation. In fact, the shape of the cells tends to be more hexagonal than either circular or square.

The cells incorporating the entrance/exit(s)of the office (DR1, DR2) - shaded cells E and C in Figure 2 - are defined as border cells. The function of the border cells will be described later.

Outside of the WIO office 100, there may lie cells of an external network such as a GSM network. In Figure 2 these cells are labelled GSM1 and GSM2. In reality, it is possible that the WIO office 100 will lie entirely within a cell of the external network. However, for ease of representation, the external cells are shown to be adjacent to and slightly overlapping the border cells E & C.

As described above, when a mobile station B which is operating an on-going call to a mobile station A within the WIO office 100, the call having been initiated while both mobiles were within the office, moves out of the office from exit DR2, for example, it moves into the cell GSM2 of the external network.

Since the call was initiated entirely within the WIO system, the MSC of the external network of which cell GSM2 forms a part has no knowledge of either the call or the identity of the mobile stations involved therewith. Consequently, when the mobile

station B moves out of the office, its handover to the cell GSM2 will not take place until the Mobile Switching Centre has established its identity and the details of the call in which it is involved.

According to the embodiment described herein, therefore, the movement of a mobile station into one of the border cells E, C of the WIO system is used to predict if and when that mobile station will move out of the WIO system and into the external network, thus requiring an external handover.

If the mobile moves into one of the border cells of the WIO system, the system begins to generate a prediction as to the likelihood of an external handover being required and when that handover must be requested. The movement of the mobile station is determined by using, for example, timing advance information conventional to GSM systems or any other suitable technique.

By using a prediction algorithm in conjunction with one or more of a number of operating parameters listed below, the GSM Radio Access Gateway 3 predicts that a handover to a cell of the external network is likely to be required a certain time (time period tp0) in advance of the handover being required. The GSM Radio Access Gateway 3 then sends a hand-off advance request, in packet-based format, to its gatekeeper 4 which forwards this message via the LAN and the GSM gateway 8 to the mobile services switching centre of the external network.

The mobile services switching centre is able then to begin preparations for the handover of the mobile station before an actual handover requirement is determined by the GSM Radio Access Gateway.

In order to generate a prediction as to the likelihood of a possible handover of a mobile to an external network, the

prediction algorithm used in the GSM Radio Access Gateway takes into account one or more of the following operating parameters specific to the mobile station:

1) The distance of the mobile station from the edge of the border cell;

2) The strength of the signal received by the mobile from the border cell's base transceiver station; and

3) The strength of the signal received by the mobile from the external cell's base transceiver station.

The prediction algorithm uses the above parameters and, based on a probability estimation of a handover being requested by the mobile station, generates an advance handover request earlier than the actual handover request.

For "normal" handovers, i.e. handovers between two cells of the WIO system, the GSM Radio Access Gateway 3 sends a handover request message to the Gatekeeper 4 according to predetermined environment reported by the mobile station satisfying a threshold level T1. These may include the relative difference between the level of the received signal transmitted by the current base transceiver station and the level of the received signal being transmitted by a base transceiver station in a different cell reaching a threshold level TL1.

In the present embodiment, the likelihood of a handover being required is predicted and a hand-off advance request is issued if the value generated by the prediction algorithm exceeds a predetermined threshold level T2. As in the case of a "normal" handover described above that value is itself determined by the individual values of one or more of the above listed parameters.

For example, subject to no other overriding parameters, the relative difference between the received signal level of the current base transceiver station and the received signal level of a base transceiver station in a different cell may need to exceed a lower threshold level, TL2, before the prediction algorithm generates a value which exceeds the threshold value T1 required for a hand-off advance message. In other words, the threshold level TL2 for the signal level parameter used, among other parameters, by the prediction algorithm to predict that a handover is *likely*, is reached before the threshold level TL1 used by the mobile to determine that a handover is *required*.

The relative strengths of the signals transmitted by the current base transceiver station and the base transceiver station of the external cell, together with other information such as the speed and direction of motion of the mobile station through the border cell, allows the prediction algorithm to determine that an external handover is likely to be required some time (time period tp0) before the mobile itself determines that such a handover is actually required. Thus the external controller can set up a communication channel in the GSM network ready for the mobile station if it does issue a handover request.

Figs 3, 4 and 5 show, respectively, the communication pathways before, during and after a handover. The following description illustrates the handover of mobile station B located in border cell E to external cell GSM2 whilst in communication with mobile station A located in cell A.

In this context, the components of cell E, i.e. the cell out of which mobile station B will move, are termed the source components while the components of cell GSM2, i.e. the cell into which mobile station B will move are termed the target components.

Before the handover (figure 3), mobile station B communicates with mobile station A by transmitting an RF, timeslot-based signal to the source base transceiver station which down-converts the signal and sends it to the source GSM Radio Access Gateway 3. The source GSM Radio Access Gateway 3 converts the signal into a packet-based format and sends it, via the IP-LAN 10, to the gatekeeper 4. The gatekeeper 4 identifies the destination mobile station as mobile station A and then sends the packet-based signal, via the IP-LAN 10, to the GSM Radio Access Gateway 3 of mobile station A. The GSM Radio Access Gateway 3 converts the signal back into GSM timeslot format and forwards it to its base transceiver station which up converts the signal to RF and transmits it to mobile station A.

While the mobile station B is within the border cell E, the source GSM Radio Access Gateway, using one or more of those parameters 1) to 3) listed above in conjunction with a prediction algorithm, generates a prediction as to the likelihood of a handover of the mobile station B from border cell E to external cell GSM2 being required.

When the required threshold level T2 of the value generated by the prediction algorithm is met, for example threshold TL2 is reached and it is determined that the mobile station B is moving towards the exit and is likely to require a handover to the GSM network, the source GSM Radio Access Gateway 3 issues a hand-off advance request which is sent to the gatekeeper 4.

The gatekeeper forwards this message in packet format via the LAN 10, to the GSM gateway. The GSM gateway converts the handover required indication message into a format recognised by the GSM mobile switching centre, such as a timeslot format, and sends it to the mobile switching centre.

The mobile switching centre then begins to set up the required

communications links necessary to set up a "dummy" call (Figure 4). In particular, a communication link for the control signals are established between the GSM Radio Access Gateway, the gatekeeper, the GSM gateway and the mobile switching centre.

When the mobile station B moves nearer the exit of border cell E and the signal level of the base transceiver station of cell GSM2 reaches threshold level T1, a normal external call is set up (although the mobile station is still inside the WIO) and then a handover request is issued. When handover is about to be performed the "dummy" call is established and the internal call is released. A normal GSM handover procedure is then effected. The payload is transferred between mobile B and mobile A via the GSM Radio Access Gateway, the GSM gateway and the MSC just before handoff. The MSC handles the handover.

The source GSM Radio Access Gateway sends the handover request to the gatekeeper who instructs the mobile station A to execute the handover and then connects the signals from the GSM gateway to the destination base station controller and disconnects the signals from the source GSM Radio Access Gateway. At this point, the handover is considered to be completed (Figure 5).

In this manner, the mobile station B is handed over from the border cell E of the WIO system into a cell GSM2 of an external network. Since the external network has advance notification of the handover, by virtue of the prediction generated by the source intranet mobile cluster interface, the required communications links necessary to execute the handover can be set up. When, and only when, those links have been set up will the gatekeeper instruct the mobile station to execute the handover.

Thus, breaks in the packet stream are minimised reducing packet loss and improving communications links.

CLAIMS:

1. A method of handing off a mobile station from an internal cellular communications network to an external cellular communications network having a network controller, the method comprising:

allocating at least one cell of the internal cellular network as a border cell;

detecting the movement of said mobile station into said border cell;

generating an advance hand-off request in accordance with a prediction algorithm which uses a set of predetermined parameters associated with said mobile station and determines when a hand-off is likely to be required; and

responsive to said advance hand-off request setting up a communication channel in the external cellular communications network for use by said mobile station when an actual hand-off request is made,

wherein said external network is a mobile communications network and said internal network is a packet switched network.

2. A method according to claim 1, wherein said internal cellular network transmits and receives a plurality of signals using the same communication standard as said external cellular network.

3. A method according to claim 1 or 2, wherein said network controller implements hand-off to said communication responsive to an actual hand-off request.

4. A method according to any preceding claim, wherein said mobile station is in communication with a base transceiver station in the internal cellular communications network prior to hand-off.

5. A method according to claim 4, wherein said predetermined parameters for use by said prediction algorithm includes timing advance information reported from the base station to the mobile station.

6. A method according to any preceding claim, wherein the internal cellular communications network comprises an internal network controller which carries out the prediction and issues said hand-off advance request.

7. A method according to claim 6, wherein said hand-off advance request is issued in packet format via a packet communication path from the internal network controller to said network controller of said external network.

8. A method of handing off a mobile station from an internal cellular communications network to an external cellular communications network having a network controller, the method comprising:

allocating at least one cell of the internal cellular network as a border cell;

detecting the movement of said mobile station into said border cell;

generating an advance hand-off request in accordance with a prediction algorithm which uses a set of predetermined parameters associated with said mobile station and determines when a hand-off is likely to be required; and

responsive to said advance hand-off request setting up a communication channel in the external cellular communications network for use by said mobile station when an actual hand-off request is made,

wherein said hand-off advance request is issued in packet format via a packet communication path from the internal network to said network controller of said external network.

9. A method according to claim 8, wherein said internal cellular telecommunications network comprises an internal network controller which carries out the prediction and issues said hand-off advance request.

10. A network controller for use in an internal cellular communications network, said internal network is a packet switched network and comprises a plurality of cells and including at least one border cell, said at least one border cell being adjacent cells of an external mobile cellular communications network having an external network controller, the internal network controller comprising:

means for detecting the movement of said mobile station into said border cell;

means for selectively issuing a hand-off advance request advising said network controller of said external network that a hand-off is likely to be required in accordance with a predetermined algorithm which uses a set of predetermined parameters associated with said mobile station; and

means for setting up a communication channel in the external communications network for use by said mobile station when an actual hand-off request is made.

11. An internal cellular network controller according to claim 10, comprising a base transceiver station operable to set up an RF communication channel with said mobile station.

12. A network controller according to claim 10 or 11, wherein said external network controller is in communication with said internal network controller by a packet communication path for transmission of said hand-off advance request.

13. A network controller for use in an internal cellular communications network which comprises a plurality of cells and including at least one border cell, said at least one border cell

being adjacent cells of an external cellular communications network having an external network controller, the internal network controller comprising:

means for detecting the movement of said mobile station into said border cell;

means for selectively issuing a hand-off advance request advising said network controller of said external network that a hand-off is likely to be required in accordance with a predetermined algorithm which uses a set of predetermined parameters associated with said mobile station; and

means for setting up a communication channel in the external communications network for use by said mobile station when an actual hand-off request is made,

wherein said external network controller is in communication with said internal network controller by a packet communication path for transmission of said hand-off advance request.

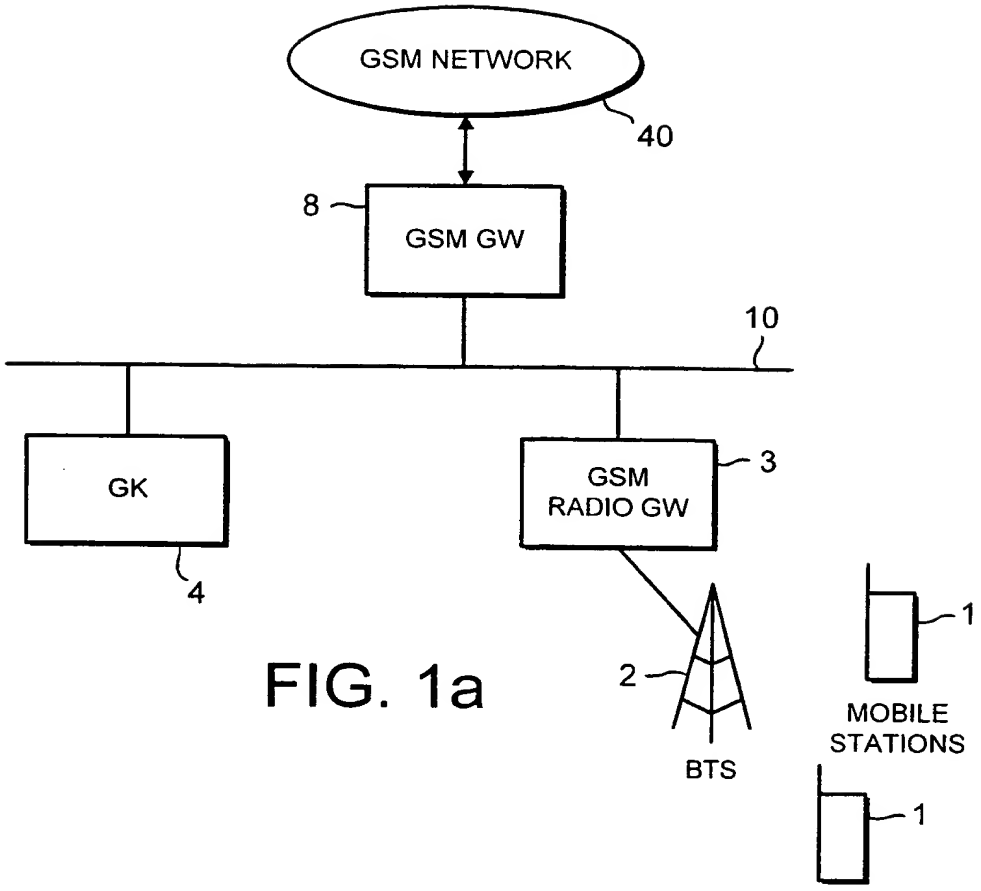
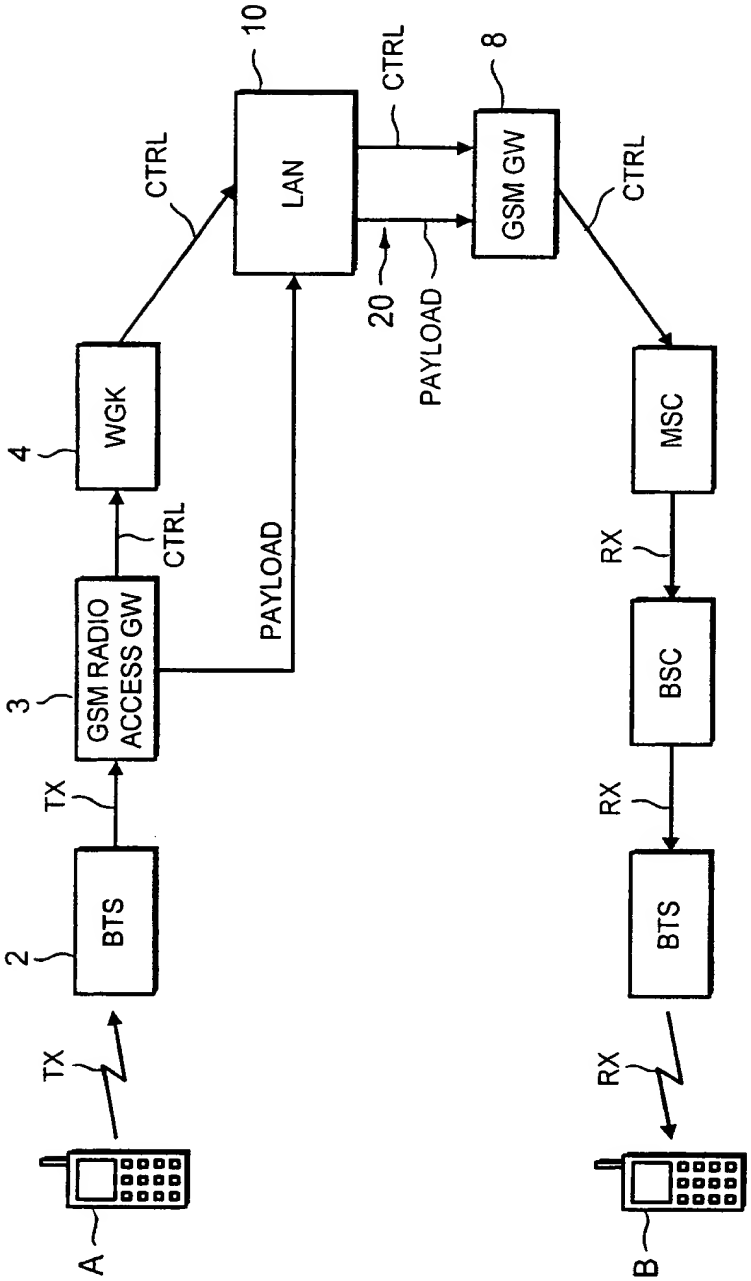

GSM NETWORK
40
8
GSM GW
10
GK
4
GSM
RADIO GW
3
2
BTS
1
MOBILE
STATIONS
1

FIG. 1a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LAN
CTRL
8
GSM GW
CTRL
CTRL
20
PAYLOAD
4
WGK
MSC
CTRL
PAYLOAD
RX
3
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BSC
TX
RX
2
BTS
BTS
TX
RX
A
B

FIG. 1b

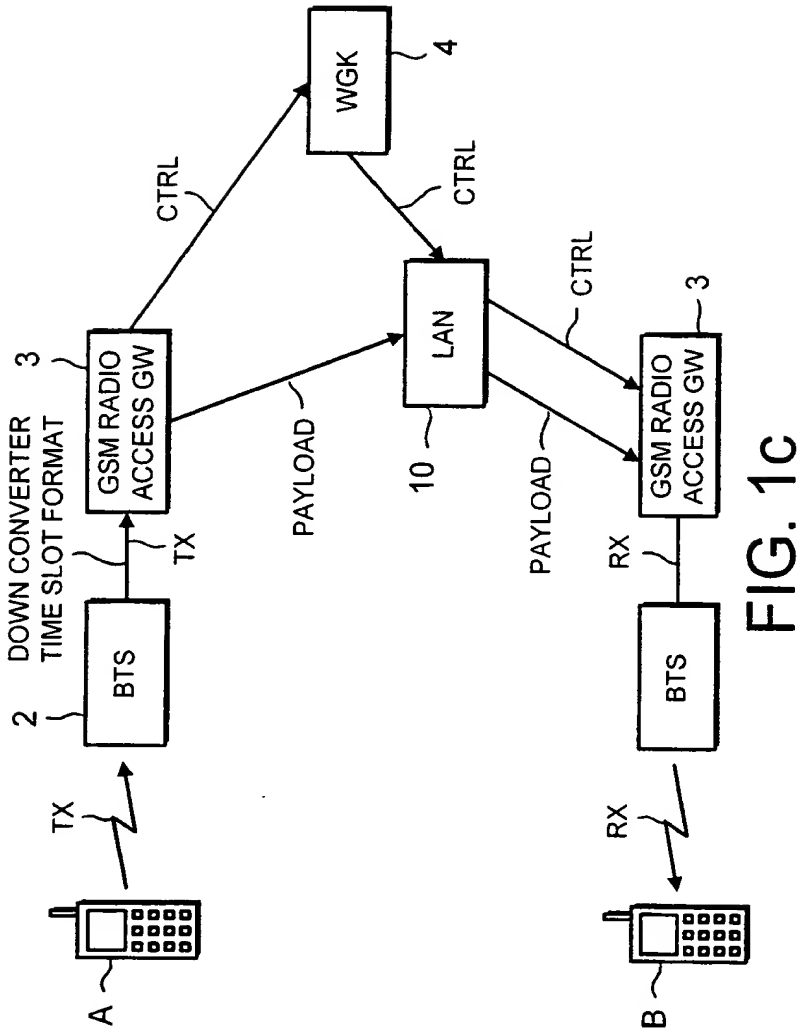
WGK
4
CTRL
CTRL
CTRL
LAN
10
3
GSM RADIO ACCESS GW
3
GSM RADIO ACCESS GW
DOWN CONVERTER TIME SLOT FORMAT
PAYLOAD
PAYLOAD
TX
RX
2
BTS
BTS
TX
RX
A
B

FIG. 1c

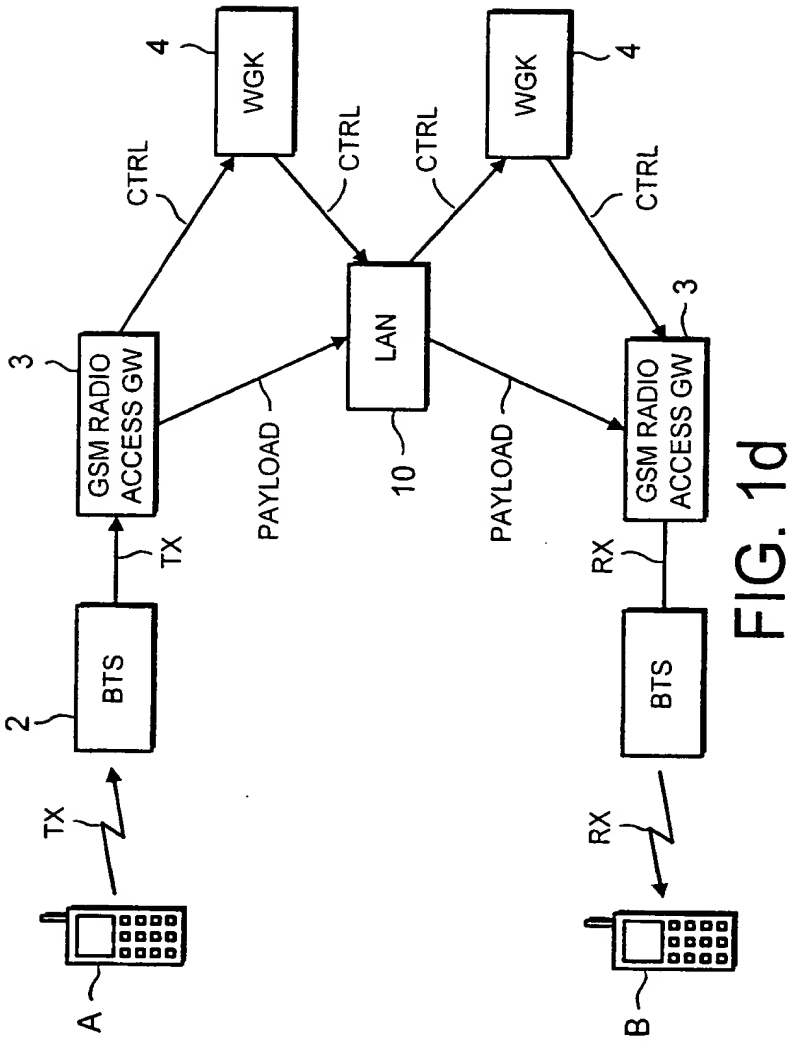
WGK
4
WGK
4
CTRL
CTRL
CTRL
CTRL
LAN
10
GSM RADIO ACCESS GW
3
GSM RADIO ACCESS GW
3
PAYLOAD
PAYLOAD
TX
RX
BTS
2
BTS
TX
RX
A
B

FIG. 1d

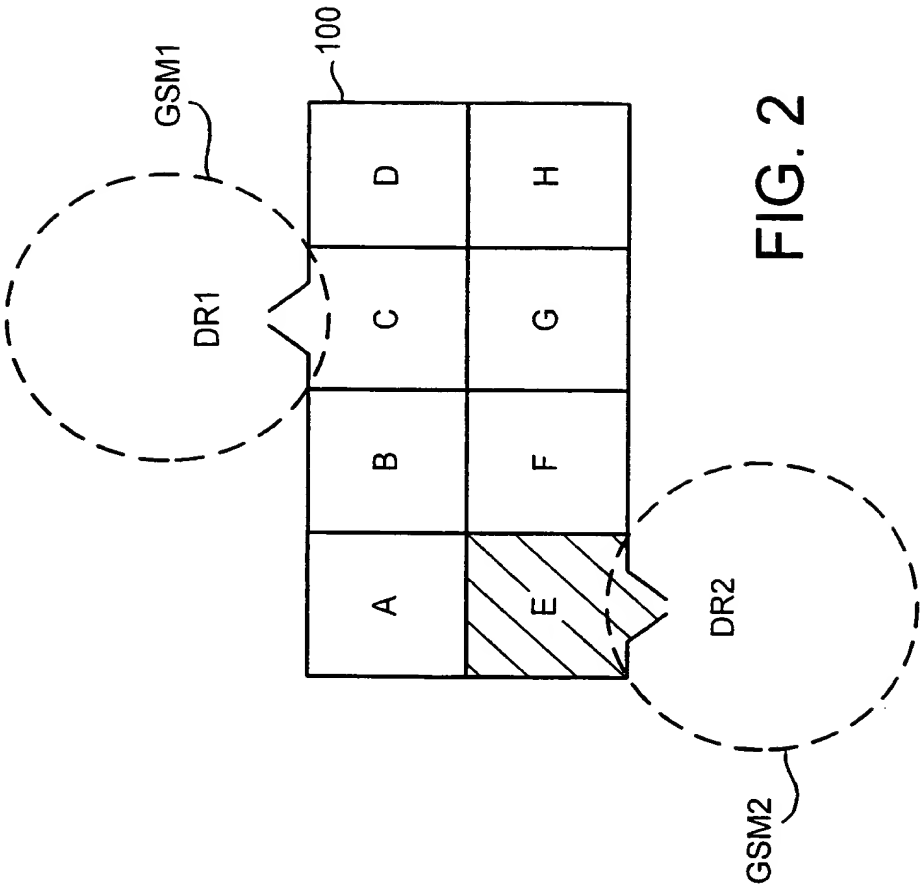

FIG. 2

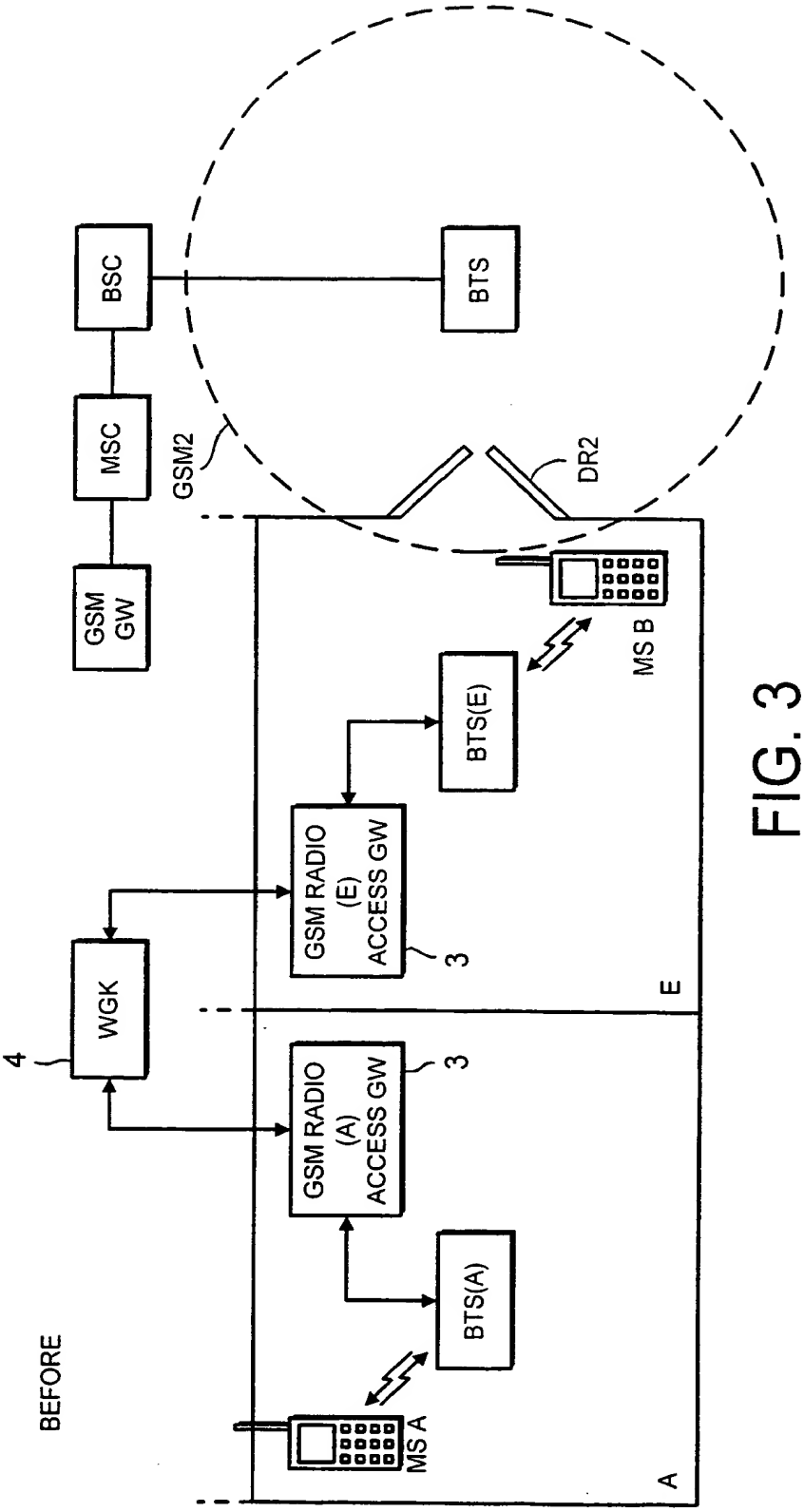
BSC
BTS
MSC
GSM2
DR2
GSM GW
MS B
BTS(E)
GSM RADIO (E) ACCESS GW
3
WGK
4
E
GSM RADIO (A) ACCESS GW
3
BTS(A)
MS A
A
BEFORE

FIG. 3

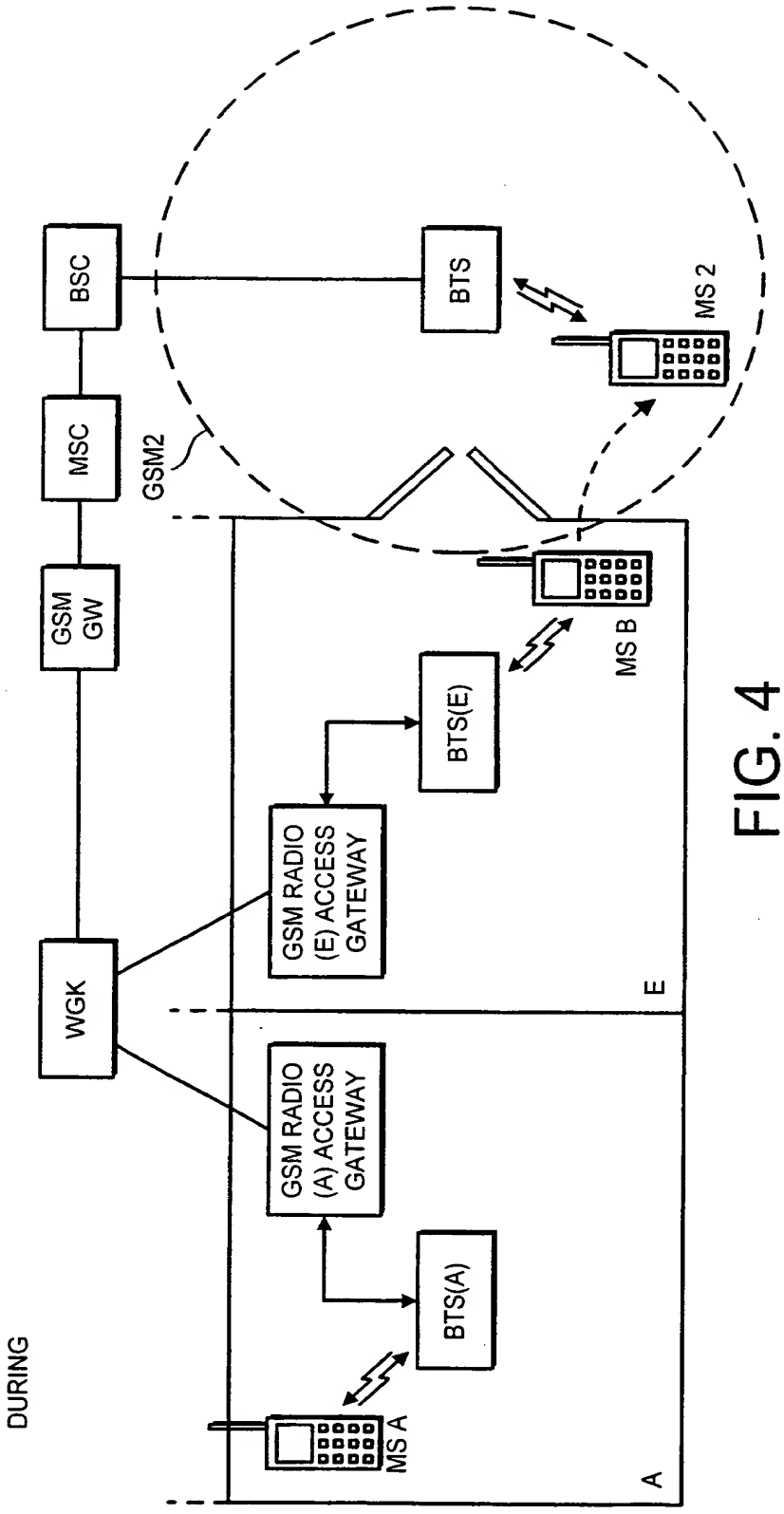
DURING
BSC
MSC
GSM GW
WGK
GSM2
BTS
MS 2
MS B
BTS(E)
GSM RADIO (E) ACCESS GATEWAY
E
GSM RADIO (A) ACCESS GATEWAY
BTS(A)
MS A
A

FIG. 4

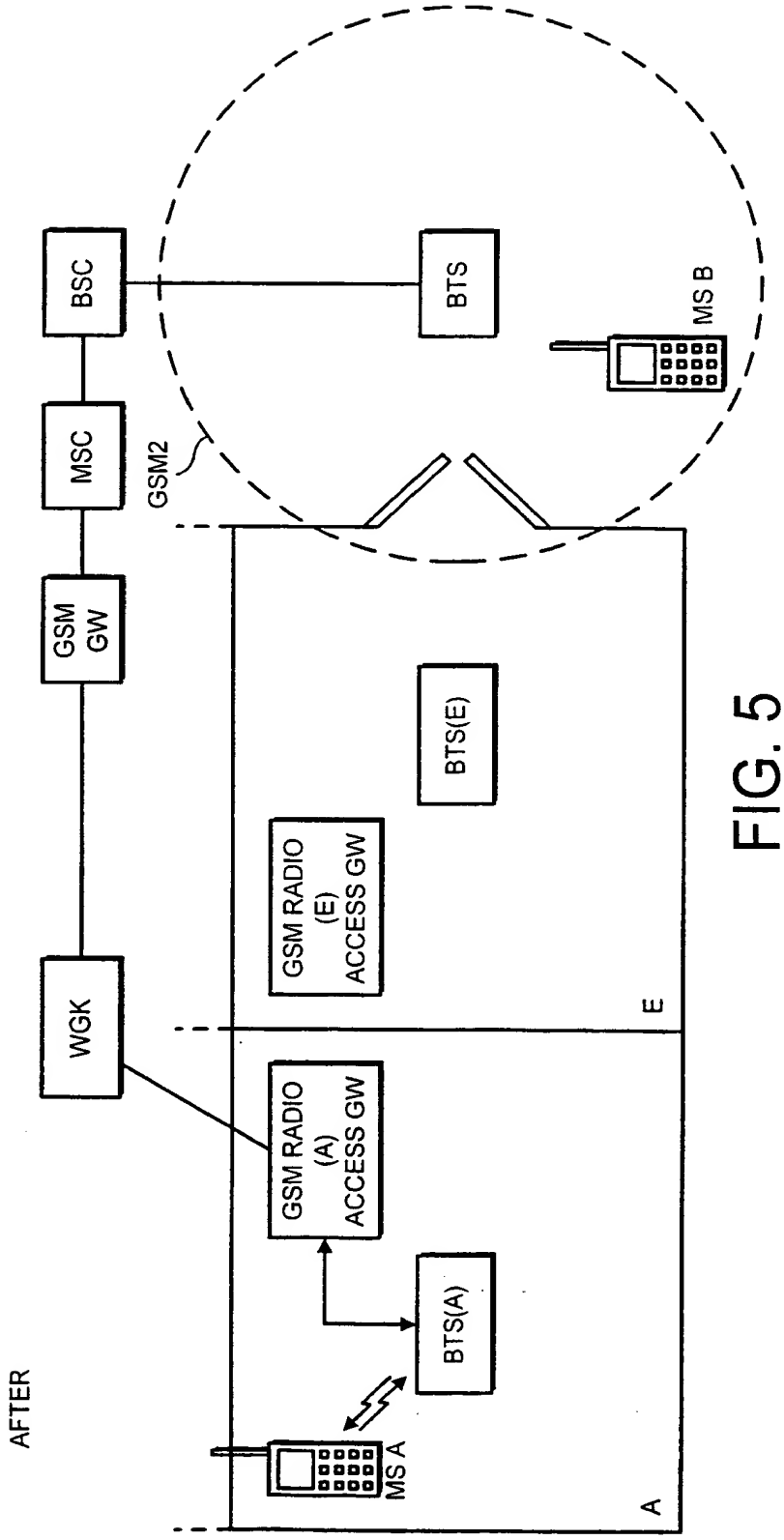
BSC
BTS
MS B
MSC
GSM2
GSM GW
BTS(E)
GSM RADIO (E) ACCESS GW
E
WGK
GSM RADIO (A) ACCESS GW
BTS(A)
AFTER
MS A
A

FIG. 5

INTERNATIONAL SEARCH REPORT

Int. ional Application No
PCT/EP 00/03756

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 725 552 A (TELIA AB) 7 August 1996 (1996-08-07) column 3, line 19 - line 39 column 6, line 43 -column 9, line 1	1,3-6, 8-13
X	US 4 737 978 A (BURKE MICHAEL ET AL) 12 April 1988 (1988-04-12) column 10, line 33 -column 12, line 14	1,3,4,6, 8-13
A	EP 0 883 266 A (TOKYO SHIBAURA ELECTRIC CO) 9 December 1998 (1998-12-09) column 24, line 36 -column 26, line 55	1,7,10
A	WO 98 25431 A (ERICSSON TELEFON AB L M) 11 June 1998 (1998-06-11) page 28, line 10 -page 29, line 24 page 45, line 9 -page 47, line 14	1,10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 August 2000	06/09/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Lõpez-Pérez, M-C

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. ional Application No
PCT/EP 00/03756

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0725552 A	07-08-1996	SE 503848 C	16-09-1996
		AU 698681 B	05-11-1998
		AU 4338296 A	15-08-1996
		SE 9500407 A	07-08-1996
		US 5873033 A	16-02-1999
US 4737978 A	12-04-1988	CA 1266884 A	20-03-1990
		US 4775999 A	04-10-1988
EP 0883266 A	09-12-1998	JP 11266278 A	28-09-1999
WO 9825431 A	11-06-1998	US 5920818 A	06-07-1999
		AU 5236398 A	29-06-1998
		BR 9713834 A	29-02-2000
		CN 1245625 A	23-02-2000
		EP 0943219 A	22-09-1999